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CHANGES IN THE DRAINAGE NEAR LANCASTER.

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The drainage changes in the headwaters of the Hocking River, caused by the ice of the Glacial epoch, have been partially worked out by Prof. Tight[1] and Mr. Leverett.[2] Their investigations relate to the changes in the river itself, to those tributaries lying to the east and to Clear Creek on the west. To the writer's knowledge, those changes which occurred in the region just west of the Hocking and between it and Clear Creek have not, as yet, been worked out. However, a brief review of the entire region may not be lacking in interest nor out of place. The writer wishes here to express his indebtedness to Prof. J. A. Bownocker for suggestions and criticisms in the preparation of this paper.

The Hocking River rises on the upland in the southeastern part of Bloom township, Fairfield county, flows eastward and enters its valley proper in the southern part of Greenfield township near Hooker. At Hooker its valley has a breadth of about two miles, but it is not very deep or well defined. At Lancaster it is more than a mile wide, but the rock hills on either side rise more abruptly and to a greater height, making the valley more conspicuous. Continuing down the stream, it narrows until at Sugar Grove it is not more than one-half mile wide, and just above Logan it is only a few hundred yards in width and very gorge-like in character. At Sugar Grove the drift in the valley, as shown by gas borings, is about 100 feet deep, at Lancaster 200 feet and at Carroll, eight miles above Lancaster, 260 feet. The elevation of Carroll above sea level is 835 feet, that of Lancaster 831 feet and Sugar Grove 769 feet.[3] This makes the rock floor

1. Bull. Denison University, No. IX, p. 33.
2. Glacial Formations and Drainage Features of the Erie and Ohio Basins, pp. 169-172.
3. Geol. Sur. of Ohio, Vol. 6, p. 802.

of the valley about 100 feet lower at Carroll than at Sugar Grove; that is, the rock floor slopes to the north in a direction opposite to that in which the present stream flows. This fact coupled with the shape of the valley makes it certain that prior to the Glacial epoch an old divide was located somewhere south of Sugar Grove. The exact site of this col has been variously placed by different writers; Prof. Tight has very recently located it about half way between Logan and Nelsonville.[4] Before the ice invasion a stream headed on the northern side of this divide, flowed northward through the valley now occupied by the Hocking, and northwest of Carroll connected with the preglacial outlet of the upper Muskingum which crossed the northern part of Fairfield county. After the ice blocked this outlet, the water forced over the old divide at the head of the stream and in time it was cut to the present level.

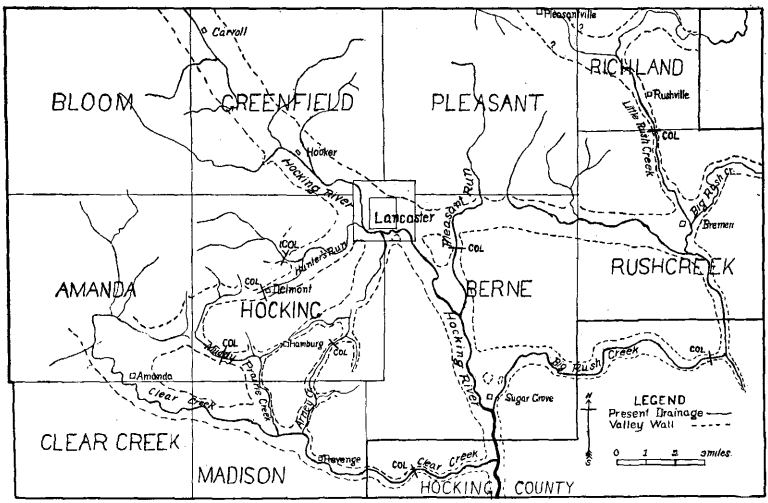

Fig. 1. Map showing drainage changes in the headwaters of the Hocking River.

Big Rush Creek is a large tributary entering the Hocking from the east at Sugar Grove. It rises near New Lexington, Perry county, flows westwardly into Fairfield county, the valley widening gradually until at Bremen it is three-quarters of a mile wide. At Bremen it turns abruptly to the south and narrows until a point in Hocking county one mile below the county line is reached. Here it is narrowest, being only 200 yards in width between the rock walls on either side, and the drift is only 20 feet deep. It

4. Professional Paper. No. 13, U. S. Geol. Survey. Drainage Modifications in Southeastern Ohio. p. 35.

there turns to the west, the valley widening until above Sugar Grove it is about half a mile wide. From Bremen to Lancaster there extends an old valley in places one mile broad and filled with drift to a depth of over 200 feet. Before the ice epoch this abandoned valley was the outlet for the waters of Big Rush Creek, a small tributary heading at the narrow point just below

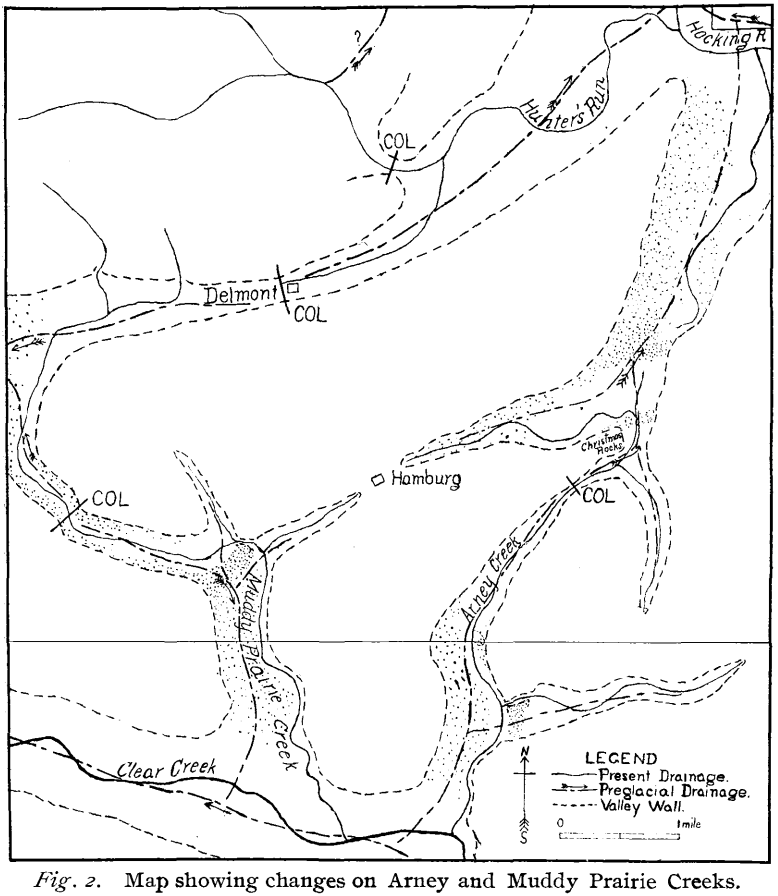

Fig. 2. Map showing changes on Arney and Muddy Prairie Creeks.

the Hocking county line where there was a low divide and flowing north to Big Rush Creek, while a second headed on the other side of the divide and flowed westward to the Hocking. The ice blocked up the old outlet at Lancaster, turning the water over this low col and cutting the present outlet.

There is one point in connection with this abandoned valley that Prof. Tight merely notices but does not connect with the

glacial history of the region. Near the western end, Pleasant Run enters the abandoned portion of the valley from the north, flows diagonally across it toward the southwest and enters a narrow valley about one mile long, the southern end of which opens into the Hocking valley. This narrow valley is about 300 yards wide at its narrowest point and is bordered by very steep rock walls 150 to 200 feet high. The floor is a level plain, in every way a continuation of the floor of the larger valley. There are no well borings which might show the depth of drift. It is not in a position for an oxbow of either the Hocking or the stream which formerly occupied the abandoned valley. It is possible that there may have been a low col in this narrow valley over which the waters from the east poured after their outlet at Lancaster had been blocked by ice but before the present outlet had been cut. Subsequent advance of ice might have blocked this outlet and the present drainage have been developed.

Little Rush Creek rises in Perry county near New Reading and flows westward into Fairfield county, entering Big Rush Creek at Bremen. In its upper course its valley is broad and two and one-half miles northeast of Rushville a depth of 160 feet was reached with no rock. A short distance above Rushville it begins to narrow. At the station a depth of 40 feet was penetrated without encountering rock, but a few hundred yards below, the valley becomes extremely gorge-like and the stream flows on rock, everything indicating the site of a col. This region was probably drained to the northwest into the preglacial outlet of the Muskingum, although the channel is now difficult to trace. A low, broad depression extends from a short distance above Rushville through to this old valley.

Clear Creek enters Hocking from the west about three miles below Sugar Grove. Its headwaters are in a rolling, drift-covered region not far from the headwaters of the Hocking, but its valley first becomes well defined near Amanda, where it is more than a mile wide and is bordered by rock hills. It narrows gradually, however, and near Revenge becomes very gorge-like although there is a flood-plain several hundred feet wide. About four miles above its juncture with Hocking, it narrows perceptibly until the flood-plain is not more than 100 yards in width, the hills being very abrupt and about 200 feet or more in height. Below this point the valley widens somewhat but not much. This narrow point is an old col. The preglacial outlet of Clear Creek is buried beneath drift deposits but was probably northwest from Amanda into the Scioto.

A valley extends from Lancaster southwest to Amanda, connecting the Clear Creek and Hocking valleys. At Lancaster it is about one mile wide but it narrows until, at Delmont five miles distant and 250 feet above Lancaster, it is about 300 yards in

width, the hills are 150 to 200 feet high and rise rather abruptly on either side. It then widens until it enters Clear Creek where its width is again about one mile. From a short distance west of Delmont the drainage is to the eastward, emptying into the Hocking at Lancaster. Between Delmont and Lancaster the valley is filled to a considerable depth with heavy and irregular deposits of drift into which the streams have cut deep trenches. From Delmont a small stream also drains to the westward into Muddy Prairie Creek of which more will be said later. The divide at Delmont between the two is very low and scarcely noticeable on passing over it on the railroad. Delmont is probably the site of an old col. The depth of drift over this col is unknown, but less than half a mile to the west, at the schoolhouse and also at a point a short distance east of the schoolhouse at an elevation about the same as that of Delmont, wells were sunk to a depth of about 180 feet and no rock was encountered. These wells are not situated in the center of the valley but near the north wall. It is possible that, after the blocking by the ice front of the old outlet of Clear Creek toward the northwest, and prior to the cutting down of the old col near the present mouth of Clear Creek, the waters of this region had an outlet over a low col at Delmont, and might have eroded it to a considerable depth. The ice, advancing farther, might have blocked this outlet and caused the cutting down of the col on the lower part of Clear Creek.

Muddy Prairie Creek, as has been mentioned, rises in the valley at Delmont on the western side of a low drift divide. It flows southwestward, in places cutting deeply into the drift filling. About two miles southeast of Delmont it leaves this broad valley and enters a narrow one between high hills, in spite of the fact that the drift divide between it and Clear Creek is only a few feet high; it is so low, in fact, that when it was proposed to drain Muddy Prairie, a large peat swamp formerly existing in the stream near this point, the engineers advised cutting through this divide to Clear Creek. The valley which it follows into the hills is only a few hundred feet in width, and an observer standing in the broad valley which the stream has just left and facing the entrance into the hills would not even suspect that it was anything but a very short tributary coming in at this point. It is bordered by terraces of roughly stratified drift 60 to 100 feet or even more above the present floor. The soil on the flood-plain is peaty and the stream very sluggish, in places cutting only a few inches below the surface. There are no wells from which the depth of drift beneath the valley floor could be obtained. The stream continues in this way with no noticeable variation in the width of its valley for a distance of a mile, when it widens somewhat and becomes more rapid, but half a mile beyond is suddenly

contracted to a width of 40 or 50 yards only and flows on a rock floor between rock walls. After emerging from this gorge, it turns to the south into a broad valley in which it continues to Clear Creek. One would naturally suppose that this was the site of an old col, but if the observer takes the trouble to climb the hill to the west of this narrow channel, he will find that it is of drift and stands directly across the valley, forcing the stream against the east wall to such an extent that it has cut a channel in the rock at that point. This drift dam is 75 to 100 feet or more in height and composed of roughly stratified gravel, a well sunk on its summit about the middle of the valley having gone to a depth of 100 feet with no rock. Below this dam the valley widens out but drift deposits have forced the stream at almost all points to the eastern wall.

Fig. 3. Old col on Arney Creek at "Jacob's Ladder."

There can be little doubt that the headwaters of this stream formerly drained into Clear Creek by the valley extending to Amanda, and that the ice has forced it over a col into the present system. The col was probably very low and possibly did not rise far, if at all, above the present floor. It is difficult to locate, but from the direction of tributary streams and the general contour of the valley, it would seem that it was probably less than a mile below the point where Muddy Prairie Creek enters the hills.

Arney Creek rises on the eastern side of a low divide at Hamburg and flows northeast toward Lancaster. For a distance of

two miles the valley widens normally, when it has a width of half a mile or more; then the stream turns to the south, the valley growing narrower, and just below Christmas rocks turns sharply to the west. The valley now becomes a gorge and a mile below the last turn there is no flood-plain and the walls rise abruptly to a height of 300 feet, the north wall, known in the region as Jacob's Ladder, presenting a vertical rock cliff in the upper 100 feet, from the top of which a splendid wiew can be obtained of the surrounding country and the gorge below. Figs. 3 and 4, taken at the turn near Christmas rocks and from positions only 200 yards apart, contrast the character of the valley at the gorge and above it. Below this constriction the valley widens and continues to Clear Creek, three miles distant.

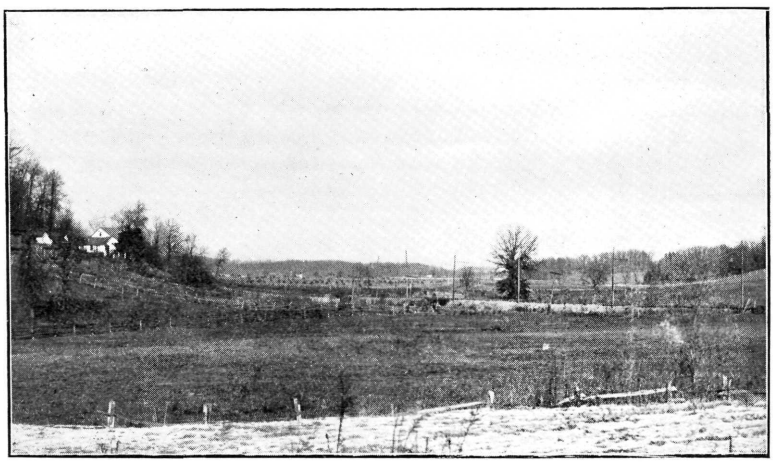

Fig. 4. Valley of Arney Creek above the col, looking towards Lancaster.

Returning to the point where the stream turns toward the south and its valley first begins to narrow, a broad valley continues in a northeast direction and joins the Hocking valley at Lancaster, where it is fully a mile wide, but Arney Creek is barred from this outlet by a drift dam 20 to 75 feet high extending across the valley in a northeast-southwest direction with a well defined, rather abrupt front. This is of till as is shown in a nearby railroad cutting, and is one of the ridges of the terminal moraine of the Late Wisconsin ice epoch. Half a mile to the south of this deposit is a second, not very well defined, broad, low ridge of similar material which probably represents the outermost limit of that ice sheet at this point. Between the dam and

Lancaster the valley is filled with irregular drift deposits in which a small, northward flowing stream and its tributaries have cut deep trenches with narrow flood-plains.

Prior to the advance of the ice there was a divide at Jacob's Ladder, one stream flowing to Clear Creek, another toward Lancaster. The ice advanced as far as the drift dam and stood at this point for some time, blocking the outlet and forcing the stream over the col at Jacob's Ladder. This, in time, was cut to the present level. While in this position, the ice deposited the debris in the mouth of the valley which prevented the return of the stream to the old channel after the advent of a milder climate and the retreat of the ice.

Below the col, as mentioned before, the valley again broadens, and at the point where it enters Clear Creek is about half a mile wide. In the immediate vicinity of the col there is no drift, but about one mile below drift terraces occur on both sides, the one on the west being more prominent. From this point to the mouth of the valley the stream has been forced by the ice to the east wall and flows in a narrow flood-plain, in at least one place passing over a rock bottom where it has been forced over a shelf. The valley west of the narrow flood-plain is occupied by drift deposits 50 to 100 feet above the stream.

About one and one-half miles below the col a tributary enters from the east. Its valley where it joins Arney Creek is about 300 yards in width, but it has been so blocked up at this point that the stream has been forced to cut a channel in the rock of the north wall. This channel is 100 feet deep, 200 yards long and barely wide enough for the small streamlet and a narrow wagon road. The sides are of rock and very steep. Much of the dam remains in the form of drift on the northern side of the valley just south of the rock channel, but at the southern side whatever blocked the old outlet has been removed, and there is an opening 100 yards wide where the dam is only a few feet above the present level of the tributary. At no point is the dam as high as the deepest part of the rock gorge. It is probable that ice which melted afterward aided greatly in blocking the old channel. It is possible that this dam is the extreme outer limit of the Late Wisconsin ice sheet at this point, as drift deposits to the west are abundant and uninterrupted while to the east they are unknown to the writer.

Hunter's Run, in the lower part of its course occupies the eastern end of the valley extending from Lancaster to Amanda which has been mentioned. About three miles southwest of Lancaster, as it enters this valley it passes through a narrow constriction between two high sandstone hills. Above this point the valley is not so well defined. There are rock hills on the south, but looking toward the north from these hills, one is impressed by

the low, rolling country which sinks gradually to the level of the Hocking valley several miles distant. It seems quite probable that the drainage above the constriction was formerly carried to the northward into Hocking, but the region was not studied closely and the course of the old outlet is undetermined.